

Name _____ Date _____ Period _____

Find the exact values (leave in terms of π) of the following sums or differences.

1. $\frac{3\pi}{4} + \frac{\pi}{3}$

2. $\frac{\pi}{4} - \frac{\pi}{3}$

3. $\frac{\pi}{2} - \frac{\pi}{6}$

Express each given angle as $\alpha + \beta$ or $\alpha - \beta$, where α and β are angles on the unit circle.

4. 75°

5. 165°

6. $\frac{\pi}{12}$

7. $\frac{5\pi}{12}$

Use appropriate identities to find the exact value of each expression.

8. $\cos(15^\circ)$

9. $\sin(105^\circ)$

10. $\tan(375^\circ)$

11. $\cos\left(\frac{13\pi}{12}\right)$

12. $\sin\left(\frac{\pi}{12}\right)$

13. $\tan\left(\frac{13\pi}{12}\right)$

14. $\cos(165^\circ)$

15. $\sin(-15^\circ)$

16. $\tan(75^\circ)$

17. $\cos\left(\frac{-5\pi}{12}\right)$

18. $\sin\left(\frac{7\pi}{12}\right)$

19. $\tan\left(\frac{7\pi}{12}\right)$

Simplify each expression by using the appropriate identities. Do not use a calculator.

20. $\cos(23^\circ)\cos(67^\circ) + \sin(23^\circ)\sin(67^\circ)$

21. $\sin(2^\circ)\cos(7^\circ) - \cos(2^\circ)\sin(7^\circ)$

22. $\sin\left(-\frac{\pi}{2}\right)\cos\left(\frac{\pi}{5}\right) + \cos\left(\frac{\pi}{2}\right)\sin\left(-\frac{\pi}{5}\right)$

23. $\cos\left(-\frac{\pi}{2}\right)\cos\left(\frac{\pi}{5}\right) + \sin\left(\frac{\pi}{2}\right)\sin\left(\frac{\pi}{5}\right)$

24.
$$\frac{\tan\left(\frac{\pi}{9}\right) + \tan\left(\frac{\pi}{6}\right)}{1 - \tan\left(\frac{\pi}{9}\right)\tan\left(\frac{\pi}{6}\right)}$$

25.
$$\frac{\tan\left(\frac{\pi}{3}\right) - \tan\left(\frac{\pi}{5}\right)}{1 + \tan\left(\frac{\pi}{3}\right)\tan\left(\frac{\pi}{5}\right)}$$

Simplify the expression by applying the odd/even identities and sum or difference identities. Do not use a calculator.

26. $\cos(10^\circ)\cos(20^\circ) + \sin(-10^\circ)\cos(70^\circ)$

For each problem use the given information to find the exact values for the following: a) $\cos(\alpha + \beta)$,

b) $\cos(\alpha - \beta)$, c) $\sin(\alpha + \beta)$, d) $\sin(\alpha - \beta)$, e) $\tan(\alpha + \beta)$, f) $\tan(\alpha - \beta)$.

27. If $\sin \alpha = \frac{3}{5}$ and $\sin \beta = \frac{5}{13}$, with α in quadrant II and β in quadrant I.

28. If $\sin \alpha = \frac{\sqrt{3}}{2}$ and $\cos \beta = \frac{-\sqrt{2}}{2}$, with α in quadrant I and β in quadrant II.

Write each expression as a function with α alone. Use the cofunction identities or sum and difference identities.

29. $\tan\left(\frac{\pi}{2} - \alpha\right)$

30. $\cos\left(\frac{\pi}{2} + \alpha\right)$

31. $\sin(90^\circ - (90^\circ - \alpha))$

32. $\cos(180^\circ - \alpha)$

Verify that each equation is an identity.

33. $\cos\left(x - \frac{\pi}{2}\right) = \cos x \tan x$

34. $\frac{\cos(x + y)}{\cos x \cos y} = 1 - \tan x \tan y$

35. $\cos(2x) = \cos^2 x - \sin^2 x$ Hint: $2x = x + x$

Simplify.

36. $\frac{\csc x}{\sec x} \cdot \frac{\csc x}{\sec x}$

37. $(1 - \sin x)(1 + \sin x)$